REMARKS

Claims 1-7, 10-12, 15-23, 23, 26-28, 31, and 32 are rejected under 35 USC §103 as being unpatentable over Tan et al., U.S. 6,226,323.

The Examiner's rejection is respectfully traversed.

Independent claim 1 recites an iterative equalizer for a data communication system for recovering received data transmitted over a data channel. The iterative equalizer includes a first linear filter for filtering a block of received data according to first filter parameters. A combiner modifies the first filtered data with second filtered data to generate modified data. A decision device generates modified tentative decisions on all data in the block based on the modified data. The modified tentative decisions are modified with respect to tentative decisions of a previous iteration. A second linear filter causally and anticausally filters the block of tentative decisions from a previous pass according to second filter parameters to generate said second-filtered data. The received block of data is filtered more than once by multiple non-simultaneous passes through the data, each pass comprising both a first filter and a second filter and first and second filter parameters are based on the received data so that intersymbol interference is removed from said modified data in a nonlinear manner.

Independent claim 17 is a method claim associated with the apparatus of claim 1.

Independent claim 15 recites an iterative equalizer for a data communication system for recovering received data transmitted over a data channel. The iterative equalizer includes a first linear filter for filtering a block of received data according to first filter parameters to generate first-filtered data. A combiner modifies the first-filtered data with second-filtered data to generate modified data. A decision device generates modified tentative decisions on all data in

the block based on the modified data, the modified tentative decisions being modified with respect to tentative decisions of a previous iteration. A second linear filter causally and anticausally filters the block of tentative decisions from a previous pass according to second filter parameters to generate said second-filtered data. The received block of data is filtered more than once by multiple non-simultaneous passes through the data, each pass comprising both a first filter and a second filter and first and second filter parameters are based on an estimate of the channel parameters. The equalizer is fractionally spaced in that the received data is sampled at a rate higher than a symbol rate associated with the received data so that intersymbol interference is removed from said modified data in a nonlinear manner.

Independent claim 31 is a method claim associated with the apparatus of claim 15.

Independent claim 11 recites an iterative equalizer for a data communication system for recovering received data transmitted over a data channel having channel parameters. The iterative equalizer includes a first filter for filtering a block of received data according to first linear filter parameters to generate first-filtered data. A combiner modifies the first-filtered data with second-filtered data to generate modified data. A decision device generates modified tentative decisions on all data in the block based on the modified data. The modified tentative decisions are modified with respect to tentative decisions of a previous iteration. A second linear filter causally and anticausally filters the block of tentative decisions from a previous pass according to second filter parameters to generate said second-filtered data. The received block of data is filtered more than once by multiple non-simultaneous passes through the data, each pass comprising both a first filter and a second filter and first and second filter parameters are based on an estimate of the channel parameters. The received data is encoded for error-

correction coding, and the decision device comprises an error-correction decoder and further comprising an encoder for error-correction encoding the tentative decisions from a previous iteration.

Independent claim 27 is a method claim associated with the apparatus of claim 11.

Tan et al. '323 describes a system for reducing the complexity of an adaptive decision feedback equalizer, for use in connection with a dual-mode QAM/VSB receiver system is described. QAM and VSB symbols, which are expressed in two's complement notation, include an extra bit required to compensate for a fixed offset term introduced by the two's complement numbering system. A decision feedback equalizer includes a decision feedback filter section which operates on symbolic decisions represented by a word length which excludes the added bit representing the offset. The vestigal word is convolved with the decision feedback filter's coefficients, while a DC component, corresponding to the excluded bit, is convolved with the same coefficient values in a correction filter. The two values are summed to provide an ISI compensation signal at the input of a decision device such as a slicer. A DC component representing a pilot tone in VSB transmission systems also introduces a DC component, and additional bits, to a VSB word length. These additional bits are similarly excluded and the vestigal representation convolved with coefficient values in a decision feedback filter. The DC component, including the pilot tone representation, is convolved with the same coefficient values in a correction filter.

While it is suggested that Tan et al. `323 describes a procedure to anticausally filter tentative decisions, it does not causally filter tentative decisions. Rather, the system of Tan et al. '323 causally filters final (non-tentative) decisions. In column 24, lines 38-51, Tan et al. '323

explains that the decisions made during the most recent N time frames are tentative (i.e. non-final) because the surviving paths are not common, while the decisions made more than N time frames ago are final (non-tentative) because the surviving paths have common branches; this fact is well known to someone skilled in the art. In column 25, lines 4-20, Tan et al. '323 suggests that the N tentative decisions are processed by the second filter anticausally, while M+1 final decisions are processed by the second filter causally. Thus, Tan et al. '323 does not causally filter tentative decisions.

The Examiner states that Tan et al. '323 describes using various different specifications and for this reason having a linear filter is obvious. The Examiner is utilizing an extreme form of hindsight to justify his position. In col. 18, lines 3-29, Tan et al. '323 mentions overall reducing the wordlength of the decision feedback filter significantly reduces complexity of the decision feedback block. Moreover, the hardware complexity of multiplication operations used is linearly reduced when the wordlength is reduced. For the Examiner to justify this teaching by Tan et al. '323 that it would be obvious to have linear filters is mere hindsight.

The Examiner asserts that Tan et al. '323 states that the same tentative decision are processed by a set of "M+1 causal coefficients" in the second filter. As argued above, the M+1 decisions are final and not tentative. This is an important distinction.

Furthermore Tan et al. '323 is silent regarding its equalizer attempting multiple non-simultaneous passes through the data, each pass comprising both a first filter and a second filter. Note Tan et al. '323 does not describe each pass comprising both a first and a second filter. Therefore, Tan et al. '323 does not render obvious independent claims 1, 11 15, 17, 27 and 31 respectively.

As to claims 2-7, 10, 12, 16, 18-23, 26, 28, and 32, they are dependent on claims 1, 11 15, 17, 27 and 31 respectively. Therefore, claims 2-7, 10, 12, 16, 18-23, 26, 28, and 32 are also allowable for the same reasons argued with respect to claims 1, 15, 11, 17, 27 and 31.

Claims 8, 13, 14, 24, 29, and 30 are rejected under 35 USC §103 as being unpatentable over Tan et al. '323 in view of Meehan, U.S. 6,115,419.

Independent claim 13 recites an iterative equalizer for a data communication system for recovering received data transmitted over a plurality of data channels having. The iterative equalizer includes a first linear filter for filtering a block of received data according to first linear filter parameters to generate first-filtered data. A combiner modifies the first-filtered data with second-filtered data to generate modified data. A decision device generates modified tentative decisions on all data in the block based on the modified data. The modified tentative decisions are modified with respect to tentative decisions of a previous iteration. A second linear filter causally and anticausally filters the block of tentative decisions from a previous pass according to second filter parameters to generate said second-filtered data. The received block of data is filtered more than once by multiple non-simultaneous passes through the data, each pass comprising both a first filter and a second filter and first and second filter parameters are based on an estimate of the channel parameters. The received data comprises a plurality of received signals received over the plurality of data channels, and the equalizer further comprises a like plurality of the first filters corresponding to the plurality of channels.

Independent claim 29 is method claim associated with the apparatus of claim 13.

Meehan '419 describes a device for improving signal reception in a signal receiver. The device comprises a beamforming circuit and decision feedback equalizer circuit. The

beamforming circuit includes two branches with each circuit branch having two feedforward equalizer circuit and an adder circuit.

Claims 13 and 29 have similar limitations as claims 1 and 17, respectively. However, claims 13 and 29 further recite that the first and second filter parameters are based on an estimate of the channel parameters. In addition, the received data comprises a plurality of received signals received over the plurality of data channels, and the equalizer further comprises a like plurality of the first filter corresponding to the plurality of channels.

The arguments provided herein regarding claims 1 and 17 are also applicable to claims 13 and 29 with respect to Lee '919. Moreover, Applicants disagree that it would be obvious to have a plurality of data channels given Tan et al. '323's deficiencies with respect to removing intersymbol interferences (ISI) in a nonlinear manner. Furthermore, Meehan '419 does not address the deficiencies of Tan et al. '323. Therefore, Applicants contend that the combination of Tan et al. '323 and Meehan '419 does not render obvious claims 13 and 29 because the deficiencies of Tan et al. '323 argued with respect to claims 1 and 17 are not obvious to one of ordinary skill.

As to claims 14 and 30, it is dependent from claims 13 and 29. Therefore, claims 14 and 30 are also allowable for the same reasons argued with respect to claims 13 and 29.

Claims 8 and 24 are dependent on claims 1 and 17, and incorporate the limitations of claims 1 and 17, respectively. Meehan '419 does not address the deficiencies argued with respect to Tan et al. '323 in claims 1 and 17. Thus, the combination of Tan et al. '323 and Meehan '419 does not render claims 8 and 24 obvious.
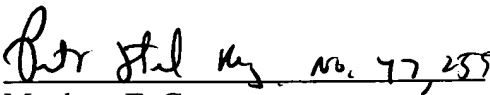
Claims 9 and 25 are rejected under 35 USC §103 as being unpatentable over Tan et al. '323 in view of Agazzi, U.S. 6,236,645.

Agazzi '645 describes a communication line having a plurality of twisted wire pairs connects a plurality of transmitters, one transmitter at each end of each twisted wire pair, with a plurality of receivers, one receiver at each end of each twisted wire pair.

Claims 9 and 25 are dependent on claims 1 and 17, and incorporate the limitations of claims 1 and 17, respectively. Agazzi '645 does not address the deficiencies argued with respect to Lee '919 in claims 1 and 17. Thus, the combination of Lee '919 and Agazzi '645 does not render claims 9 and 25 obvious.

In view of the foregoing, Applicants respectfully submit that the cited prior art, taken alone or in the suggested combinations, does not support a *prima facie* case of obviousness under the provisions of 35 USC §103. Accordingly, Applicants contend that the pending claims are patentable over the prior art of record, and an early indication of same is requested.

Respectfully submitted,

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